IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

APPLICANT(s):	M. Parikka et al		
SERIAL NO.:	09/473,765	ART UNIT:	2875
FILING DATE:	12/29/99	EXAMINER:	Sember, T.
TITLE:	A BACKLIGHTING LIGHT PIPE FOR ILLUMINATING A FLAT-PANEL DISPLAY		
ATTORNEY DOCKET NO.:	297-009122-US (PAR)		

Commissioner of Patents
P.O. Box 1450
Alexandria, VA 22313-1450
ATTENTION: BOARD OF PATENT APPEALS AND INTERFERENCES

APPELLANTS' BRIEF
(37 C.F.R. §1.192)

This is an appeal from the final rejection of the claims in the above-identified application. A Notice of Appeal was mailed on December 5, 2003. The fees required under 37 C.F.R. §1.17 are being submitted herewith. This brief is being submitted in triplicate. The appendix of claims are attached hereto.

I. REAL PARTY IN INTEREST

The real party in interest in this Appeal is:

Nokia Mobile Phones, Ltd.

II. RELATED APPEALS AND INTERFERENCES

There are no directly related appeals or interferences regarding this application.

III. STATUS OF CLAIMS

Claims 1 - 29 pending in the application.

Claims 1 - 29 have been finally rejected.

The claims on appeal are 1 - 29.

IV. STATUS OF AMENDMENTS

There was no amendment under 37 C.F.R. 1.116.

V. SUMMARY OF INVENTION

In brief, the invention relates to a new light pipe (313, 718, 719, 720, 900) for providing backlighting (312, 15) of a flat-panel display (311) by means of at least one light source(L3, L4, L5, L6, 901) so that the light pipe has at least one surface (see C in Fig. 3A) which comprises patterns (Figs. 3A, 4, 5A, 7, 8, 9A, 10). The patterns have diffraction properties for conducting the light in the direction of the display, and the patterns comprise uniform, mutually different areas having a certain distribution on the surface of the light pipe (Fig. 3C; p. 5, ll. 11-13). The local outcoupling efficiency (Fig. 6) of the light pipe depends on the characteristic properties of the patterns, which are dependent on the distance to the light source or its wavelength (p. 6, l. 30, to p. 7, l. 5). The patterns are selected to provide a substantially uniform light output from the display (see Fig. 3C; p. 5, ll. 30-33; p. 11, ll. 1 - 6).

The invention defined by the independent claims is:

1. A light pipe (900) comprising:

a first surface (C in Fig. 3A), said surface including patterns (Figs. 9A, 10) having diffractive properties for coupling light out from the light pipe to provide backlighting (312, 15) of a flat-panel display (311) by means of at least one light source (L3, L4, L5), said patters comprising uniform, mutually different areas distributed on said first surface (Fig. 3C; p. 5, ll. 30-33; p. 11, ll. 1-6);

wherein the light pipe further comprises first pixel like formations (902) having a first orientation and second pixel-like formations (903) having a second orientation being different than that of the first pixel-like formations orientation, residing close to the light input end of the light pipe, said pixel-like formations being arranged to diffract the light for producing uniform lighting (p. 11, ll. 1-6).

17. A light pipe arrangement comprising:

a light source (L3, 901),

a display (311),

a light pipe (313, 718, 719, 720, 900), and

a base plate (314) of the light pipe,

wherein

the light pipe is limited by a first surface (C in Fig. 3A), said surface comprises patterns, said patterns have diffractive properties for coupling the light out from the light pipe to provide backlighting of a flat-panel display (311) by means of at least one light source (901), said patterns comprise uniform, mutually different areas with a distribution on said first surface; and

wherein the light pipe further comprises first pixel-like formations (902) having a first orientation and second pixel-like formations (903) having a second orientation being different than that of the first pixel-like formations orientation, residing close to the light input end of the light pipe, said pixel-like formations being arranged to diffract the light for producing uniform lighting (p. 11, ll. 1-6).

23. A light pipe (313, 718, 719, 720, 900) comprising:

a first surface (C in Fig. 3A), said surface including two dimensional patterns (Figs. 3A, 4, 5A, 7, 8, 9A, 10) having diffractive properties for coupling light out from the light pipe to provide backlighting of a flatpanel display (311) by means of at least one light source (901), said patterns comprising uniform, mutually different areas distributed on said first surface.

24. A light pipe arrangement comprising:

a light source (L3, L4, L5, L6, 901),

a display (311), and

a light pipe (313, 718, 719, 720, 900)

wherein

the light pipe is limited by a first surface (C in Fig. 3A), said surface comprises two dimensional patterns (Figs. 3A, 4, 5A, 7, 8, 9A, 10), said patterns have diffractive properties for coupling the light out from the light pipe to provide backlighting of a flat-panel display (311) by means of at least one light source, said patterns comprise uniform, mutually different areas with a distribution on said first surface.

25. A light pipe (313, 718, 719, 720, 900) comprising:

a first surface (C in Fig. 3A), said surface including pixel patterns (Figs. 3A, 4, 5A, 7, 8, 9A and 10) having diffractive properties for coupling light out from the light pipe to provide backlighting of a flat panel display (311) by means of at least one light source (L3, L4, L5, L6, 901), said patterns comprising uniform, mutually different areas distributed on said first surface.

26. A light pipe arrangement comprising:

a light source (L3, L4, L5, L6, 901)

a display (311), and

a light pipe (313, 718, 719, 720, 900),

wherein

the light pipe is limited by a first surface (C in Fig. 3A), said surface comprises pixel patterns (Figs. 3A, 4, 5A, 7, 8, 9A, 10), said patterns have diffractive properties for coupling the light out from the light pipe to provide backlighting of a flat-panel display (311) by means of at least one light source, said patterns comprise uniform, mutually different areas with a distribution on said first surface.

27. A light pipe comprising:

a first surface (C in Fig. 3A), said surface including patterns, (Figs. 3A, 4, 5A, 7, 8, 9A, 10) having diffractive properties for coupling light out from the light pipe to provide backlighting of a flat panel display (311) by means of at least one light source (L3, L4, L5, L6, L7, 900), said patterns

comprising uniform, mutually different areas distributed on said first surface including close to said light source.

28. A light pipe arrangement comprising:

a light source (L3, L4, L5, L6, L7, 900),

a display (311), and

a light pipe (313, 718, 719, 720, 900),

wherein

the light pipe is limited by a first surface (C in Fig. 3A), said surface comprises patterns (Figs. 3A, 4, 5A, 7, 8, 9A, 10), said patterns have diffractive properties for coupling the light out from the light pipe to provide backlighting of a flat-panel display (311) by means of at least one light source, said patterns comprise uniform, mutually different areas with a distribution on said first surface including close to said light source.

VI. ISSUES

1. Whether claims 1-10, 12 and 15-28 are anticipated under 35 USC 102 by Shiono (US 5,742,433).
2. Whether claims 1-10, 12 and 15-29 are anticipated under 35 USC 102 by JP 61-35585.
3. Whether claims 11 and 13-14 are obvious under 35 USC 103 by Shiono or JP '585.

VII. GROUPING OF CLAIMS

The claims do not stand or fall together.

The claims are grouped as follows:

Group I - claims 23, 24, 27 and 28;

Group II - claims 25 and 26;

Group III - claim 29;

Group IV - claims 1-10, 12 and 15 - 18;

Group V - claims 11 and 13 - 14; and

Group VI - claims 19 - 22.

VIII. ARGUMENT

A. The Rejections

It is well know that to anticipate, every element of a claim must be found in a single reference, Kalman v. Kimberly-Clark, 218 USPQ 781, 789. Further, functional limitations can be given patentable weight, In re Land and Rogers, 151 USPQ 621; In re Barr 170 USPQ 330.

Beginning from page 2 of the final rejection office action, the Examiner states that the Shiono reference would disclose something "…to provide backlighting of a flat panel display…". At the bottom of page 4 the Examiner states that "backlighting is exactly what Shiono et al is doing". It is submitted that these statements do not have any real basis in Shiono.

The applicants have run a computerized search function through the whole literal disclosure of Shiono, looking for character strings "backl" or "displ" without finding a single match. In the light of this observation, the applicants find it very difficult to believe that Shiono would disclose anything about providing backlighting to displays.

On the other hand the applicants have found the following text passages in Shiono:

"One of conventional diffractive optical devices is a diffractive microlens" (column 1, lines 27-28)

"Light which is incident vertically on a bottom survace of the substrate 11 is collected or collimated above the substrate 11" (column 1, lines 34-36)

"The grating section 2 has a grating pattern as shown in FIG. 5 in order to collect the light 5 incident at an offset angle at point 3" (column 5, lines 57-59)

"The diffractive optical device 20…is used as a cylindrical off-axis lens for collecting light" (column 9, lines 2-4)

"The diffractive optical device 30 is an off-axis lens" (column 12, lines 13-14)

All of these passages consistently illustrate how Shiono is interested in making lenses that collect (i.e. concentrate) light. For the purpose of such collecting, Shiono says in column 5, lines 66-67, the following: "At [the focal] point 3, an optical data recording medium such as an optical disc may be placed." It is well known to everyone familiar with the technology of optical data recording that the aim there is to concentrate the light beam into as small a spot as possible, in order to enable packing the bits into the optical data recording medium as tightly as possible. Shiono's aim of producing (optimally point-formed, i.e., zero-sized) light spots is the opposite from the applicant's claims aim of producing uniform backlighting for a display.

The Examiner has pointed out on page 4 of the final rejection Fig. 6 of Shiono as disclosing backlighting. However, at point 3 is an optical disc (col. 5, ll. 66 and 67), which reflects light 6 back to the optical device 10 (col. 6, ll. 1-4). The Examiner also refers to Fig. 2, but it merely shows a cross-sectional view (col. 1, ll. 32 and 33). Thus neither figure or their accompanying description provide support for backlighting.

All of the independent claims recite the backlighting feature. Since this feature is not disclosed by Shiono, it is therefore submitted that the rejection of claims 1-10, 12 and 15-28 under 35 USC 102 on Shiono be reversed. Further, since there is no suggestion of this feature in Shiono, these claims are not obvious over it.

Turning now to JP 61-35585, from its international classification certain initial conclusions might be drawn. H01S 3/18 (which later has been transferred to H01S 5/30) is a class for "semiconductor lasers; structure or shape of the active region; materials therefore". The reference publication JP 61-35585 discloses a way of "obtaining a semiconductor laser device which operates stably in the longitudinal single mode even during the modulation, by providing variations in the refractive index in the direction of propagation of light in a region on or near an active layer to which a photoelectric field extends" (English abstract, paragraph, "purpose"). There is admittedly a light guide layer 2 and certain diffractive structures on one surface thereof, but their purpose is not to couple light out of the light guide or provide backlighting as presently claimed, but to stabilize the operation of the semiconductor laser during modulation. The spatial changes in the dimensioning of the

diffractive structure cause the average refractive index to be larger at the center of the cavity than near the ends of the cavity, which helps to obtain an oscillation mode at a wavelength which is shorter than the Bragg wavelength.

If one compares this to the present independent claims, it is noted that there is almost nothing in common except the words "diffractive structure" and "lightguide". Nothing is JP 61-35585 suggests backlighting any displays as is presently claimed. Nothing in JP 61-35585 suggests coupling light out from the light guide using diffractive structures as is also claimed. It is submitted that that arrangements aiming at producing a single, heavily concentrated powerful laser ray are wildly different than arrangements aiming at producing a smooth, uniform, even backlight to a two-dimensional display as presently claimed.

Since backlighting is not disclosed in JP-'585, it is therefore submitted that the rejection of claims 1-10, 12 and 15-29 under 35 USC 102 on JP 61-35585 should be reversed. Further, since there is no suggestion of this feature in JP-'585, these claims are unobvious over it.

The details recited in claims 11 and 13-14 provide uniform brightness (see p. 5, lines 30-33; p. 11, lines 1-6). Thus, contrary to the Examiner's assertion at the bottom of p. 3 of the final rejection, they do provide an advantage and unexpected result. Hence the rejection of these claims under 35 USC 103 on Shiono or JP 61-35585 should be reversed since these values are not a mere matter of design choice.

B. The Claim Groups

I. Claims 23, 24, 27 and 28 recite the backlight feature, which patentably distinguishes over the references as explained above.

II. Claims 25 and 26 recite the backlighting and further recite "pixel-like" or "pixel patterns". This is totally different from the arcs or straight lines across the diffractive microlens of Shiono or JP '585. For this additional reason these claims are not anticipated or made obvious by the references.

III. Claim 29 recites the backlighting and further recites the uniform lighting. As discussed above, this combination is totally missing from the references. For this additional reason, this claim is not anticipated or made obvious by the references.

IV. Claims 1-10, 12, 15 - 18 recite the combination of backlighting, pixels or pixel like, and uniform lighting. Thus these claims are additional patentable since such a combination is totally missing from the references.

V. Claims 11 and 13-14 recite (in addition to the above combination) the details of how uniform lighting is achieved in some particular embodiments, which details are not in the references. Thus they are separately patentable for this additional reason.

VI. Claims 19 - 22 additionally recite that the geometry (claims 19 and 21) or fill factor (claims 20 and 22) varies with position so that light brightness is constant with position along the light pipe. Since these features are not disclosed or

suggested by the references, these claims are additionally patentable for this reason.

CONCLUSION

In conclusion, this Honorably Board is requested to reverse all rejections.

The appendix of the claims is attached hereto. A check in the amount of $330 is enclosed herewith for the appeal brief fee. The Commissioner is hereby authorized to charge payment for any additional fees associated with this communication or credit any over payment to Deposit Account No. 16-1350.

Respectfully submitted,

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Signature: Carolina Rodriguez
Person Making Deposit

IX. APPENDIX OF CLAIMS

The texts of the claims involved in the appeal are:

1. A light pipe comprising:

a first surface, said surface including patterns having diffractive properties for coupling light out from the light pipe to provide backlighting of a flat-panel display by means of at least one light source, said patterns comprising uniform, mutually different areas distributed on said first surface;

wherein the light pipe further comprises first pixel-like formations having a first orientation and second pixel-like formations having a second orientation being different than that of the first pixel-like formations orientation, residing close to the light input end of the light pipe, said pixel-like formations being arranged to diffract the light for producing uniform lighting.

2. A light pipe according to Claim 1 wherein

said patterns comprise parallel elongated surface formations, the height and width of which differ from the environment,

said patterns comprise a first uniform area, in which a characteristic parameter has a first value;

said patterns comprise a second uniform area, in which said characteristic parameter has a second value, which differs from said first value;

and the surface formations in said first area differ from the surface formations in said second area with regard to said characteristic parameter, and said characteristic parameter is at least one of the following: orientation of the pattern, distance between the pattern and the light source, period length, fill factor, fill ratio, height, characteristic degree of modification, angle of deflection between the elongated surface formations of the pattern.

3. A light pipe according to claim 2, wherein the value of at least one characteristic parameter depends on a value defined in relation to the light source.

4. A light pipe according to claim 2, wherein the elongated patterns of the surface formations change gradually from first shapes at a first end of the pattern at a light source side to other shapes at an opposite side of said pattern at another end in a manner depending on a quantity, which is dependent on a relation to the light source.

5. A light pipe according to claim 2, wherein a local plane in the area of a pattern, which plane is determined by peaks of the surface formations of the patterns, is at an angle in

relation to a plane determined by the first surface of the light pipe.

6. A light source according to claim 2, wherein at least one of the patterns has a fill ratio, and the fill ratio increases when moving from the end at the side of the light source to the opposite end of the light pipe.

7. A light source according to claim 1, wherein distribution of the patterns depends on a quantity which is dependent on a relation to the light source.

8. A light pipe according to claim 1, wherein said first surface is on a side of the light pipe, which is closest to the display.

9. A light pipe according to claim 1, wherein elongated shapes of surface formations in the patterns are repeated in a uniform area of the surface of the light pipe.

10. A light source according to claim 1, wherein at least one of the patterns has a fill ratio, the fill ratio increases along a central line of the light pipe from an end at the side of the light source to an opposite end of the light pipe, and the pattern has elongated formations, which are perpendicular to the central line.

11. A light source according to claim 1, wherein the pattern has a fill ratio between 0.2 and 0.5.

12. A light pipe according to claim 1, wherein at least one of the patterns has a fill ratio, the fill ratio increases as measured along a straight line when moving away from the light source, and the pattern has elongated surface formations, which are bowed, whereby the midpoint defined by the dimensions of the light source is located essentially at a focal point characterizing the bow.

13. A light pipe according to claim 2, wherein at least one pattern has a diffractive structure with a period length between 1.5 and 3.5 µm.

14. A light pipe according to claim 1, wherein depth and/or height of elongated surface formations of the surface is between 0.3 and 0.7 µm.

15. A light pipe according to claim 1, wherein the light pipe has a polygonal shape, with at least one angle, which differs substantially from 90°.

16. A light pipe according to claim 1, wherein the light pipe has fluorescent and/or phosphorescent properties.

17. A light pipe arrangement comprising:

a light source,

a display,

a light pipe, and

a base plate of the light pipe,

wherein

the light pipe is limited by a first surface, said surface comprises patterns, said patterns have diffractive properties for coupling the light out from the light pipe to provide backlighting of a flat-panel display by means of at least one light source, said patterns comprise uniform, mutually different areas with a distribution on said first surface; and

wherein the light pipe further comprises first pixel-like formations having a first orientation and second pixel-like formations having a second orientation being different than that of the first pixel-like formations orientation, residing close to the light input end of the light pipe, said pixel-like formations being arranged to diffract the light for producing uniform lighting.

18. A light pipe arrangement according to claim 17, having three light sources.

19. A light pipe according to claim 1 wherein the diffractive patterns have a geometry which is varied with position on said light pipe so that brightness of light is constant with position along said light pipe.

20. A light pipe according to claim 1, wherein the diffractive patterns have a fill factor which is varied with position on said light pipe so that brightness of light is constant with position along said light pipe.

21. A light pipe arrangement according to claim 17, wherein the diffractive patterns have a geometry which is varied with position on said light pipe so that brightness of light is constant with position along said pipe.

22. A light pipe arrangement according to claim 17, wherein the diffractive patterns have a fill factor which is varied with position on said light pipe so that brightness of light is constant with position along said light pipe.

23. A light pipe comprising:

a first surface, said surface including two dimensional patterns having diffractive properties for coupling light out from the light pipe to provide backlighting of a flat-panel display by means of at least one light source, said patterns comprising uniform, mutually different areas distributed on said first surface.

24. A light pipe arrangement comprising:

a light source,

a display, and

a light pipe,

wherein

the light pipe is limited by a first surface, said surface comprises two dimensional patterns, said patterns have diffractive properties for coupling the light out from the light pipe to provide backlighting of a flat-panel display by means of at least one light source, said patterns comprise uniform, mutually different areas with a distribution on said first surface.

25. A light pipe comprising:

a first surface, said surface including pixel patterns having diffractive properties for coupling light out from the light pipe to provide backlighting of a flat panel display by means of at least one light source, said patterns comprising uniform, mutually different areas distributed on said first surface.

26. A light pipe arrangement comprising:

a light source,

a display, and

a light pipe,

wherein

the light pipe is limited by a first surface, said surface comprises pixel patterns, said patterns have diffractive properties for coupling the light out from the light pipe to provide backlighting of a flat-panel display by means of at least one light source, said patterns comprise uniform, mutually different areas with a distribution on said first surface.

27. A light pipe comprising:

a first surface, said surface including patterns having diffractive properties for coupling light out from the light pipe to provide backlighting of a flat panel display by means of at least one light source, said patterns comprising uniform, mutually different areas distributed on said first surface including close to said light source.

28. A light pipe arrangement comprising:

a light source,

a display, and

a light pipe,

wherein

the light pipe is limited by a first surface, said surface comprises patterns, said patterns have diffractive properties for coupling the light out from the light pipe to provide backlighting of a flat-panel display by means of at least one light source, said patterns comprise uniform, mutually different areas with a distribution on said first surface including close to said light source.

29. The light pipe of claim 1, wherein said light out from the light pipe is substantially uniform with distance from the light input end.